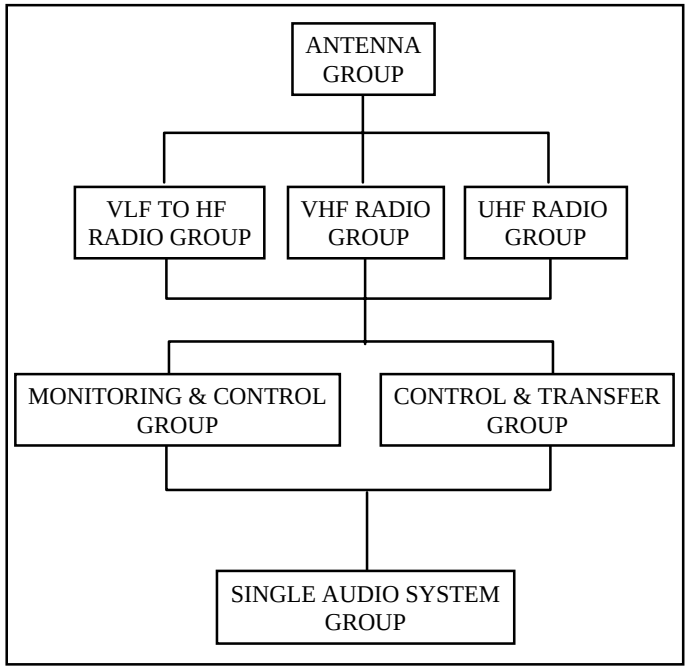
TCS COMMUNICATION REQUIREMENTS ON LHA (EXAMPLE)

	UHF, VHF SECURE & CLEAR	HF SECURE & CLEAR	INTERIOR VOICE COMM SYSTEM	GUARD 243.0 & 121.5	1MC	3MC & 5MC	21MC	AIRCRAFT CONTROL NET 1JG2	AVIATION FUEL AND SERVIDE NET 4JG2	SOUND POWERED 1JV, 1JS
UAV CONTROL CENTER										
MISSION COMMANDER	X	X	X	L	L	L	X	X	X	X
AIR VEHICLE OPERATOR	X	X	X		L	L		X	X	X
PAYLOAD OPERATOR	X	X	X		L	L		X	X	X
FLIGHT DECK										
AV CREW CHIEF			X		L	L		X	X	X
AV CREW MEMBER			X		L	L		X	X	
HANGER DECK										
AV CREW CHIEF			X		L	L		X	X	
AV CREW MEMBER			X		L	L		X	X	

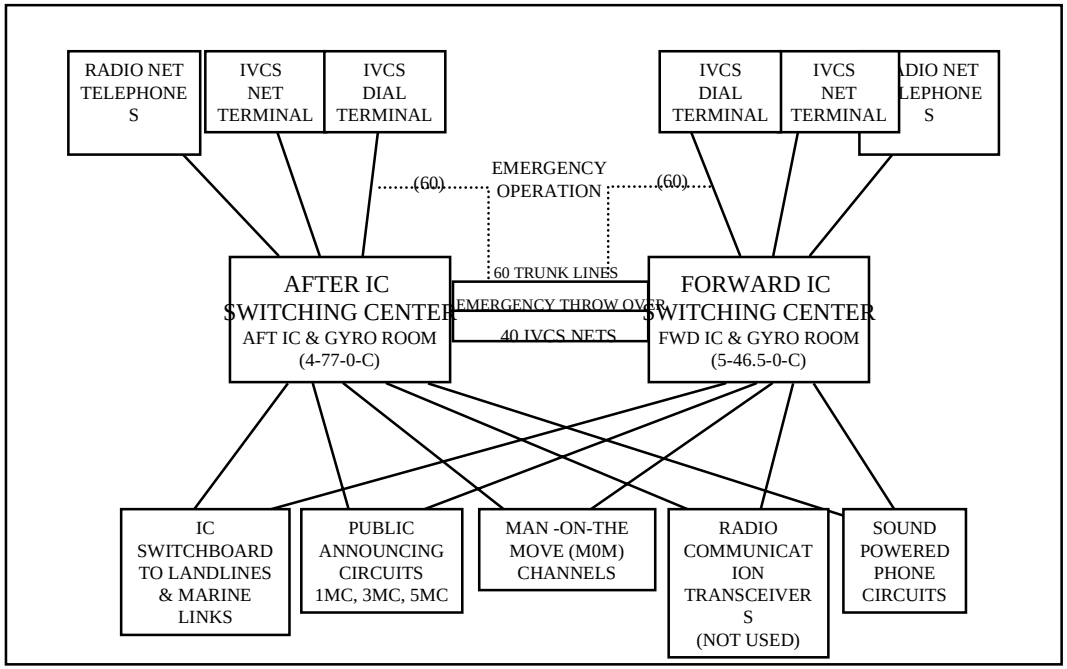
X: VOICE COMMUNICATIONS INTERFACE REQUIRED

L: LISTEN ONLY

LHA COMMUNICATION SYSTEMS TO BE USED BY TCS

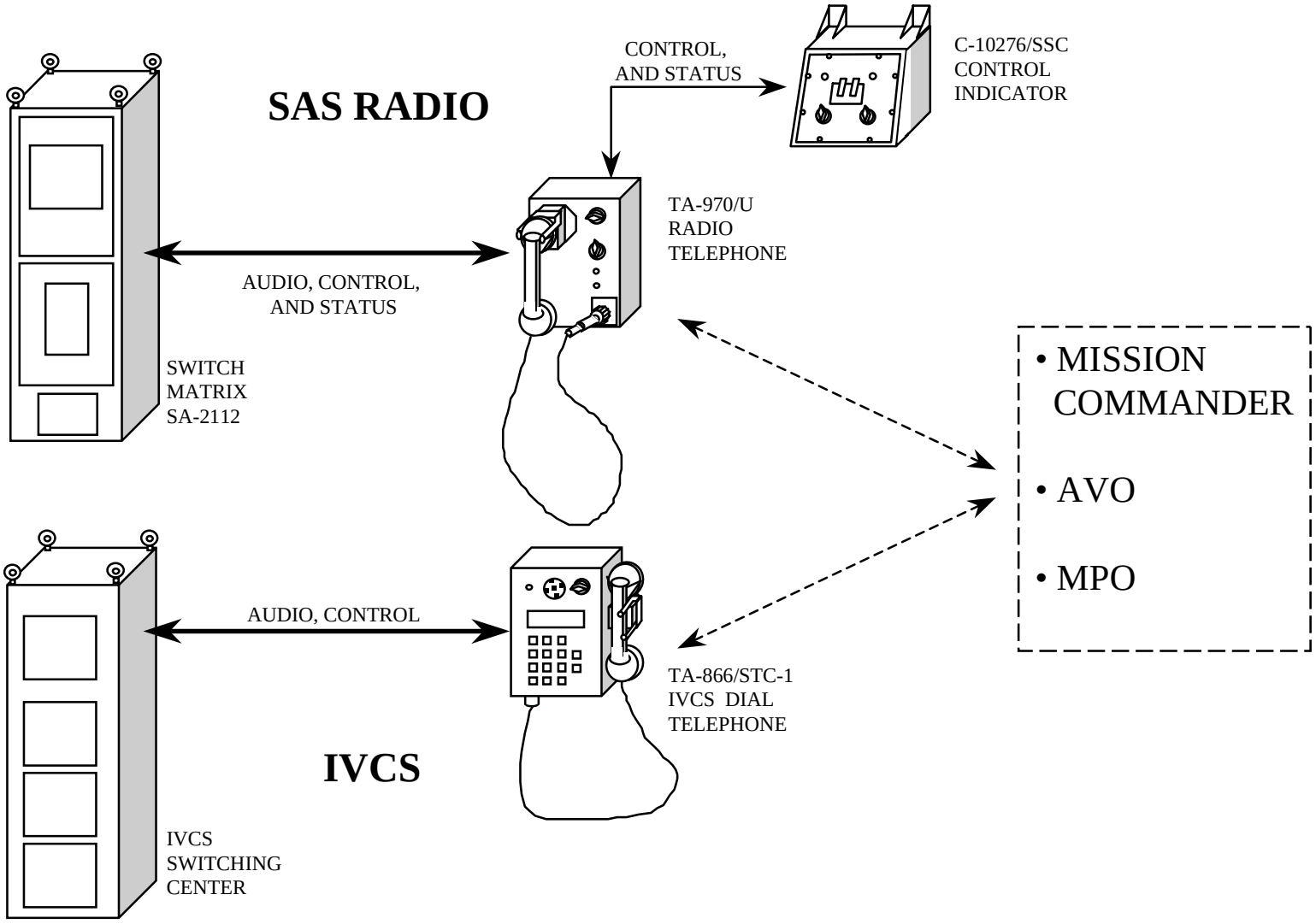


SINGLE AUDIO SYSTEM RADIO

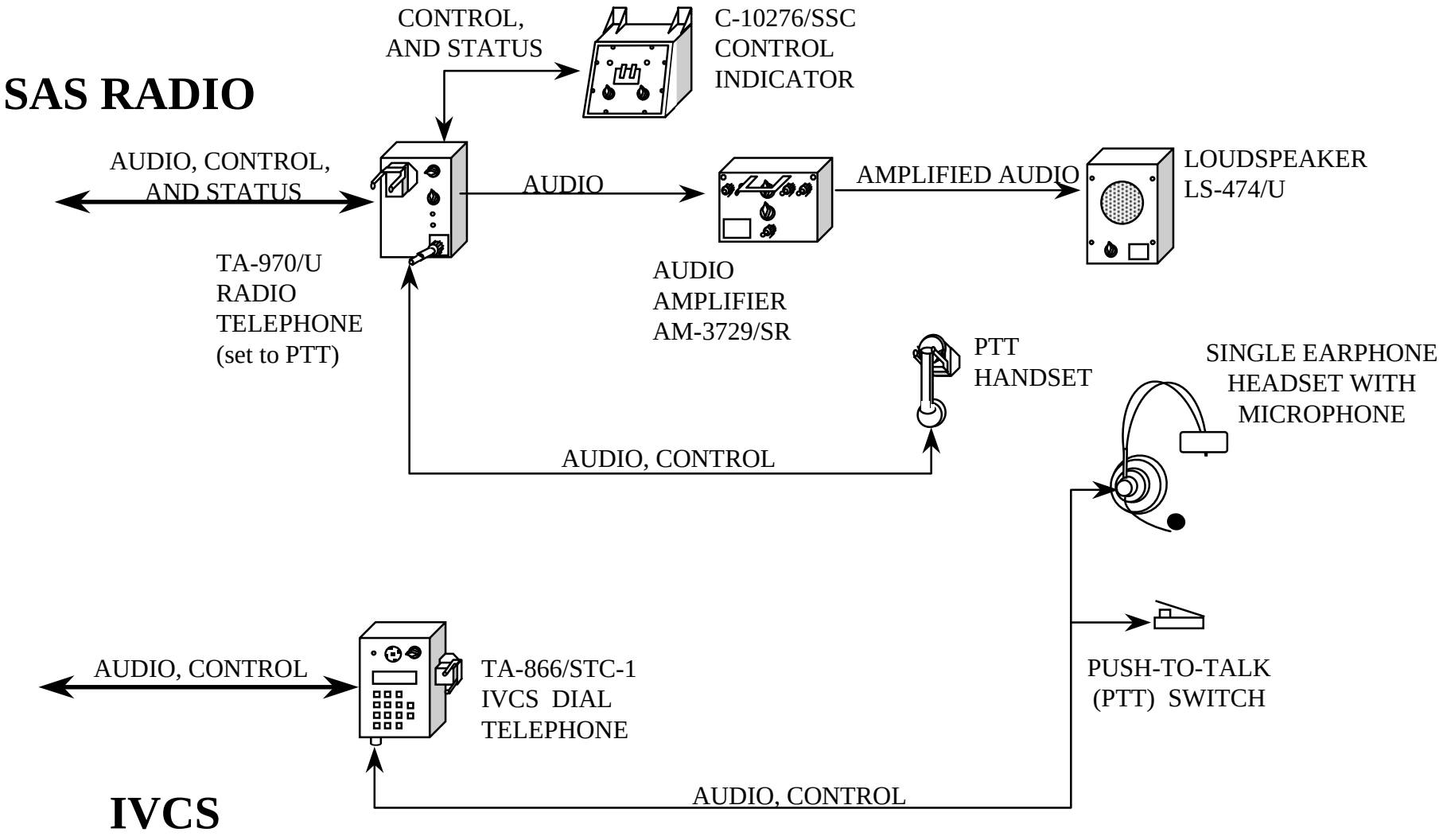


INTERIOR VOICE COMMUNICATION SYSTEM

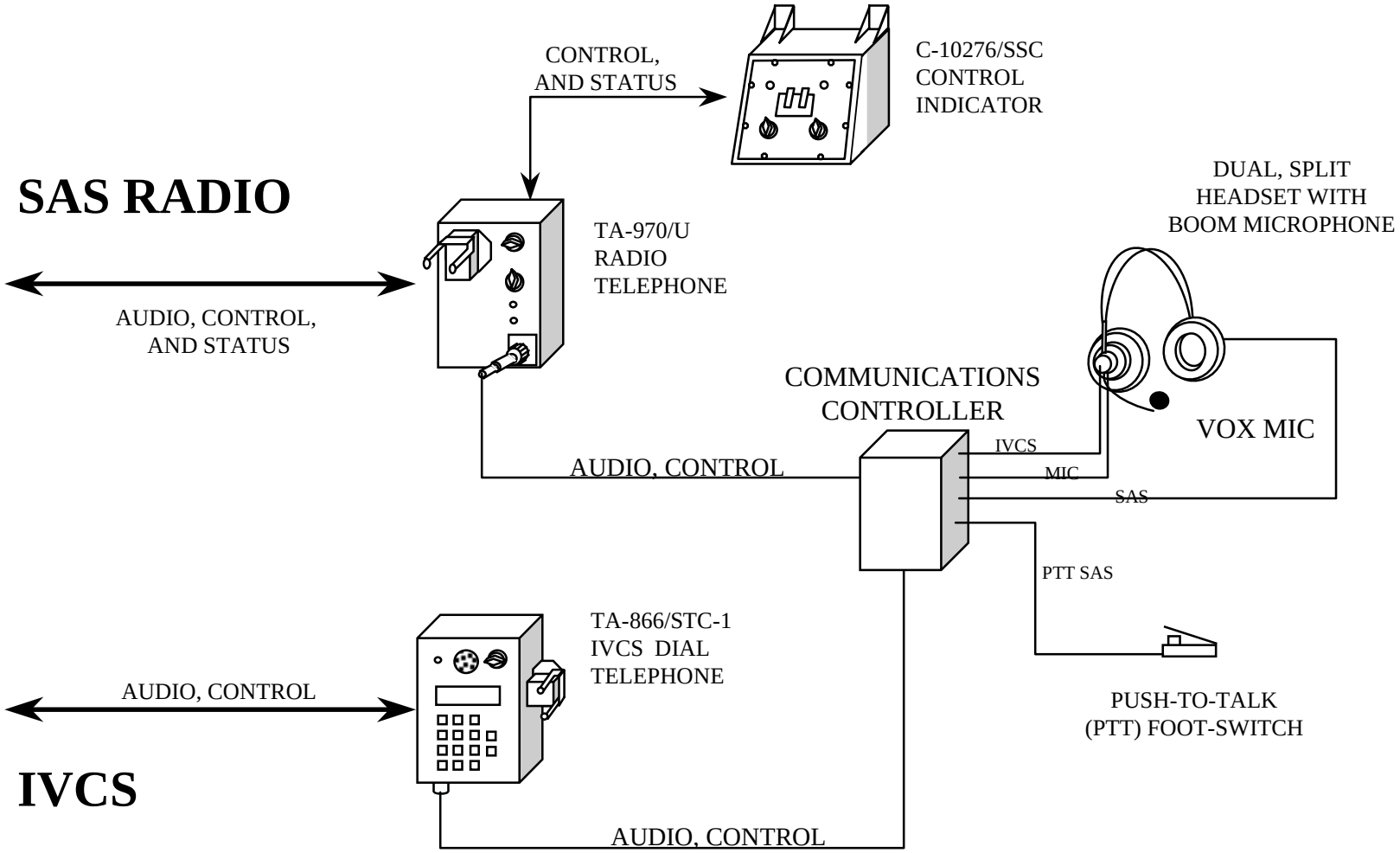
POSSIBLE COMMUNICATION SYSTEM IMPLEMENTATION



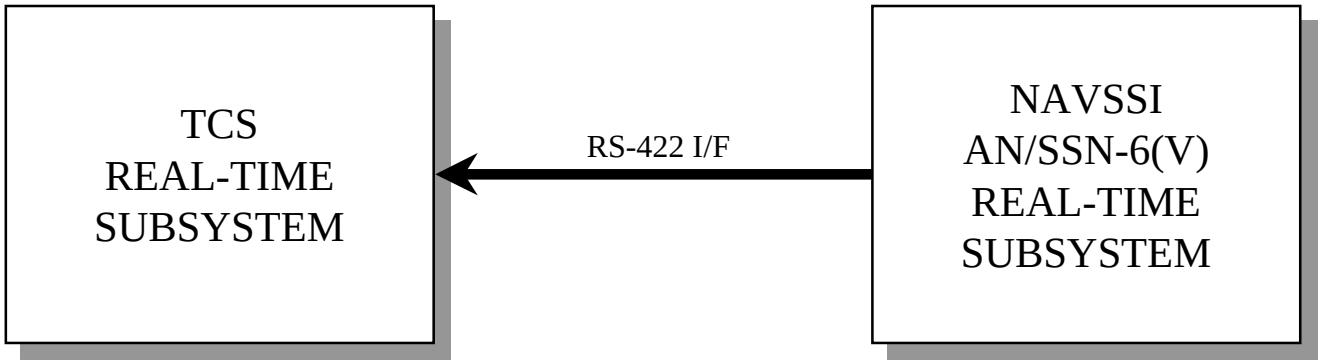
TCS POSSIBLE COMMUNICATIONS
"OPEN COMMS"



TCS POSSIBLE COMMUNICATIONS
"CLOSED COMMS"



GEOPOSITIONAL / NAVIGATION DATA INTERFACE FOR TCS-SB



TCS NAVIGATION MESSAGE

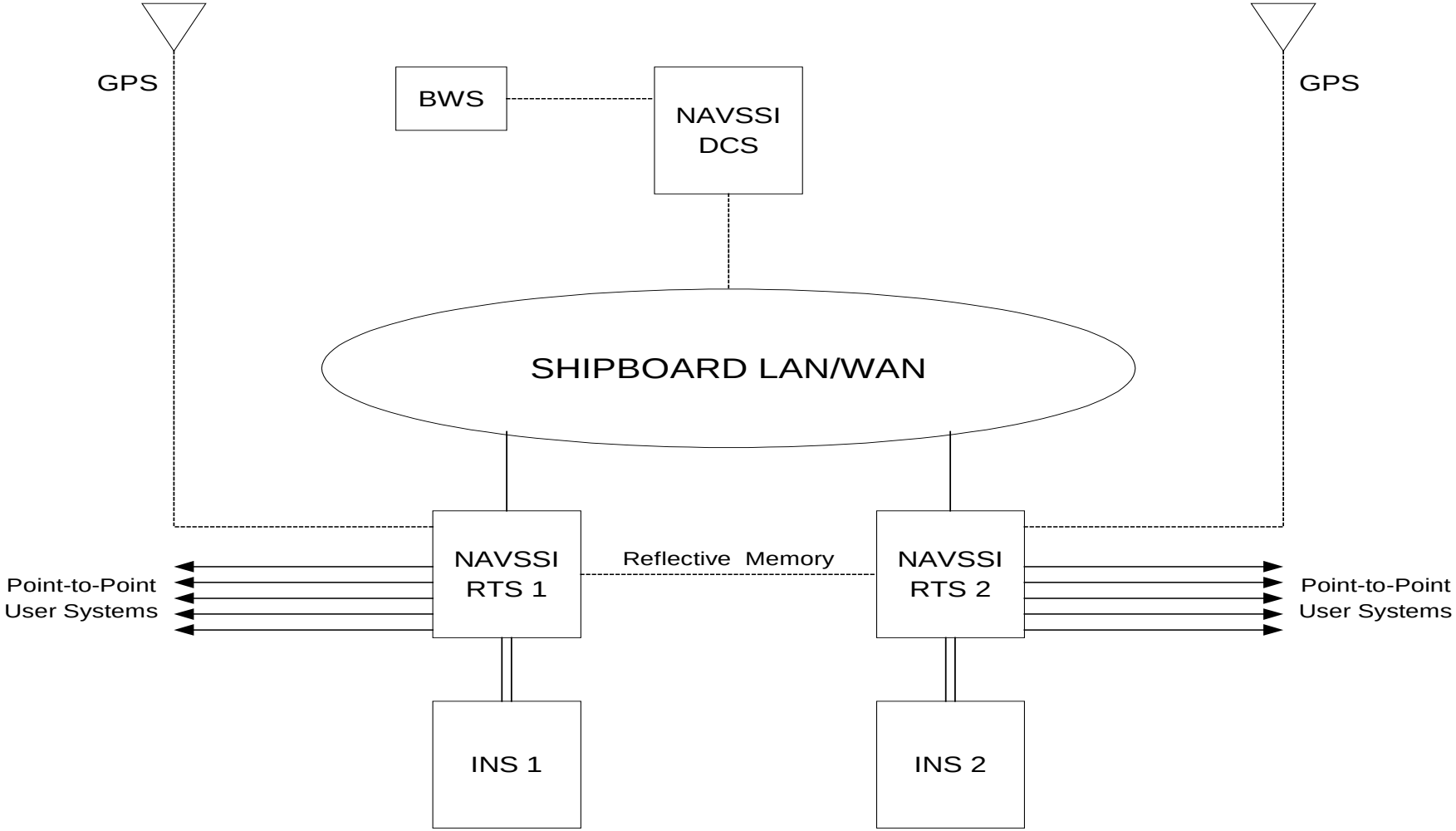
```
GPS TIME
   WEEKS,SECONDS,NANOSECONDS
CURRENT SHIP'S TIME
LATITUDE
LONGITUDE
ALTITUDE
HEADING
HEADING RATE
COURSE
VELOCITY
   NORTH,EAST,VERTICAL COMPONENT
ROLL
ROLL RATE
PITCH
PITCH RATE
YAW
YAW RATE

NOMINAL RATE OF 10HZ.
```

TCS to AN/SSN-6(V) NAVSSI I/F

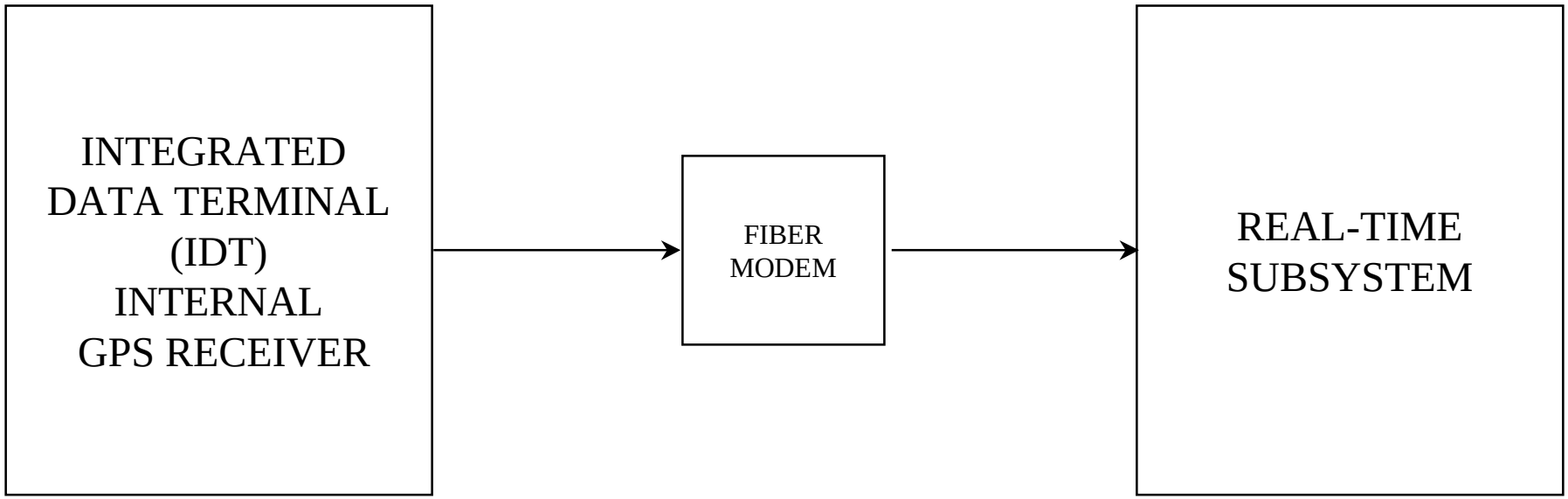
- VERSION: 0.1
- DATE:
- STATUS: IN PROCESS - DRAFT WRITTEN
  - –MOA WITH NAVSSI PROGRAM OFFICE BEING WORKED
  - –LAND BASED SOLUTION, SHIP BOARD SOLUTION
    - GPS (C & P CODE) FOR LAND
    - NAVIGATION SYSTEM INTERFACE FOR SHIP
      - –SOURCE: NAVIGATION SENSOR SYSTEM INTERFACE (NAVSSI) AN/SSN-6(V)
      - –IDD IN DEVELOPMENT
- TARGET RELEASE DATE: 5 JAN 97
  - –REQUIRES APPROVAL BY NAVSSI PROGRAM OFFICE

NAVSSI SYSTEM BASIC ARCHITECTURE

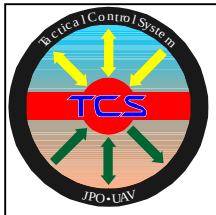


GEOPOSITIONAL INPUT FOR TCS LAND BASED SYSTEMS

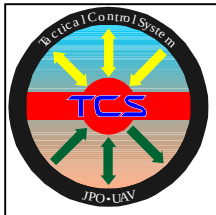
TCS REAL-TIME SUBSYSTEM to IDT IDD



INTERNAL INTERFACE - SHOWN FOR CLARITY ONLY



C4I INTERFACE PRESENTATION



INTERNAL INTERFACES

INTERNAL INTERFACE IDENTIFICATION

- Types of Internal Interfaces
  - Software to Software
    - Interfaces Between CSCIs Executing on the Same Machine
      - Example: TCS Route, Payload & Communications Planner CSCI to TCS Data Server CSCI
  - Software to Hardware
    - Interfaces Between CSCIs and HWCIs
      - Example: DII/COE to TCS Printer
  - Hardware to Hardware
    - Physical Interfaces Between TCS HWCIs
      - Example: Integrated Data Terminal to Video Support Equipment
      - Example: Real-Time Subsystem to Antenna Pedestal

INTERNAL INTERFACE IDENTIFICATION

TCS INTERFACES (DRAFT)	TYPE	DOCMNT	STATUS	DOCUMENT NAME
TCS Component Interfaces				
Software to Software Interfaces				
DII/COE to TCS Common Air Vehicle and Payload SW	N/A	SDD	UD	TCS SW VER X.X SDD
DII/COE to TCS C4I Interfaces	N/A	SDD	UD	TCS SW VER X.X SDD
DII/COE to TCS Route, Payload and Communications Planner	N/A	SDD	UD	TCS SW VER X.X SDD
TCS Data Server to Common Air Vehicle and Payload SW Functionality	LAN	IDD	VER 1.0	DS I/F IDD
TCS Core to TCS Route, Payload and Communications Planner	LAN	IDD	VER 1.0	TCS - RPC PLNR IDD
TCS Common Air Vehicle and Payload SW to C4I Interfaces SW	N/A	N/A	CANC	N/A
Software to Hardware Interfaces				
DII-COE to Internal Printer	RS-232	SDD	UD	TCS SW VER X.X SDD
DII-COE to External Printer	LAN	IDD	UD	C4I IDD
DII-COE to External Storage	LAN	IDD	UD	C4I IDD
Operating System to TCS Computer	N/A	SDD	UD	TCS SW VER X.X SDD
C4I Interfaces to C4I Support Equipment REPLACE WITH DII COE to C4I Support Equipment	N/A	N/A	CANC	N/A
TCS Common Air Vehicle and Payload SW to Video Support	RS-232	IDD	OPEN	TCS - VIDEO SUPPORT SUBSYSTEM IDD
TCS Common Air Vehicle and Payload SW to VCR	RS-170A	IDD	OPEN	TCS - VIDEO SUPPORT SUBSYSTEM IDD
TCS Common Air Vehicle and Payload SW to SAR Processor	LAN	IDD	VER 1.0	TCS - SAR PROCESSOR IDD VER 2.0 UD
TCS Real-Time Processor to DCMs (AV Standard Interface - [AVSI])	LAN	IDD	VER1.1	TCS SEG - AV STD SEG IDD

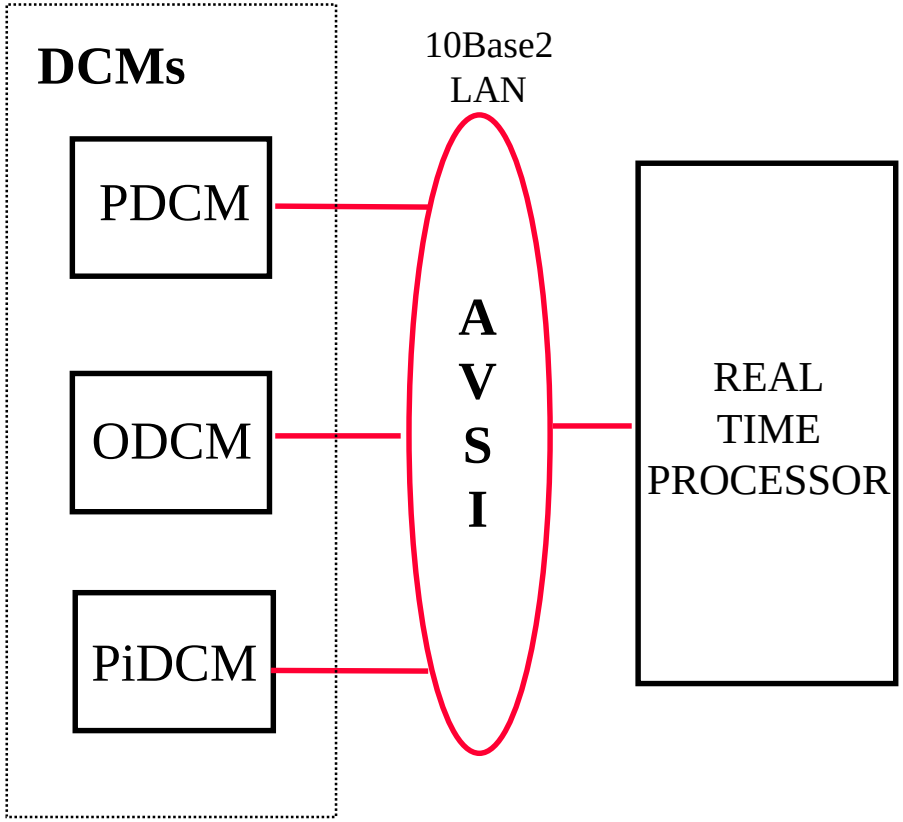
INTERNAL INTERFACE IDENTIFICATION

TCS INTERFACES (DRAFT)	TYPE	DOCMNT	STATUS	DOCUMENT NAME
Hardware to Hardware Interfaces				
TCS Computer to C4I Support Equipment (TCIM)	SCSI	IDD	VER 1.0	TCS - TCIM IDD
TCS Computer to Printer	RS-232	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
TCS Computer to Video Support (Smart Encoder)	RS-232	IDD	OPEN	TCS - VIDEO SUPPORT SUBSYSTEM IDD
TCS Computer to VCR - Control Interface	RS-422	IDD	VER 1.0 UD	TCS - VCR CTRL I/F IDD
Video Support to VCR - Video I/O	RS-170A	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
TCS Computer to SAR Processor	LAN	SDD	VER 1.0	TCS - SAR PROCESSOR IDD VER 2.0 UD
TCS Computer to REAL-TIME Computer Assembly	LAN	IDD	VER 1.0	DS I/F IDD
REAL-TIME Computer Assembly to DCMs	LAN	IDD	VER 1.1	TCS SEG - AV STD SEG IDD VER 1.2 UD
TCS Computer to Co-located TCS Computer(s)	LAN	SDD	VER 1.0	DS I/F IDD
Datalink Control Modules to Integrated Data Terminal (IDT)	RS-422	IDD	OPEN	AV DCM - IDT IDD
IDT to LOS Antenna Assembly	RF	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
SAR Processor to Ku Datalink Terminal	FDDI	ICD	UD	CONFIGURATION X.X DRAWINGS
REAL-TIME Computer to LOS Antenna Assembly	RS-422	IDD	UD	TCS RTP - LOS ANT CTRL (TAC-92)
DCM to Ku Datalink Terminal	RS-422	IDD	OPEN	DCM to Ku Datalink Terminal
SAR Processor to Linear Digital Tape Drive	SCSI	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
TCS Computer to External Data Storage	LAN	IDD	UD	TCS - C4I SYSTEM IDD
Ku Datalink Terminal to Ku Antenna Assembly	RF	ICD	UD	CONFIGURATION X.X DRAWINGS
Real-Time Computer Assembly to Integrated Data Terminal (IDT)	RS-422	IDD	VER 1.0	TCS RTP - IDT IDD
TCS Computer to Operator Output	RGB	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
TCS Computer to Operator Input	RS-232	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
Real-Time Computer Assembly to IBLS	LAN	IDD	UD	TCS RTP - IBLS IDD
TCS Real-Time Computer Assembly to UCARS	LAN	IDD	UD	TCS RTP - UCARS IDD
TCS REAL-TIME Computer Assembly to TCS Manual Controls	RS-422	ICD	UD	CONFIGURATION X.X DRAWINGS
UPS to Power Distribution and Control Assembly	PWR	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
TCS Computer to UPS	PWR	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
Real-Time Subsystem to UPS	PWR	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS
AV Communications Subsystem to UPS	PWR	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS

INTERNAL INTERFACE IDENTIFICATION

TCS INTERFACES (DRAFT)	TYPE	DOCMNT	STATUS	DOCUMENT NAME
TCS External Interfaces				
TCS REAL-TIME Computer Assembly to Navigation / Geoposition System	RS-422	IDD	VER 1.0 UD	TCS RTP - NAVSSI IDD
Predator MAE AV C-Band LOS Interface	N/A	NDI	NDI	N/A
Predator MAE AV Ku-Band SATCOM Interface	N/A	NDI	NDI	N/A
Outrider TUAV C-Band LOS Interface	N/A	NDI	NDI	N/A
TCS Intercommunications Subsystem to External Communications Systems (Voice)	ANALOG	ICD	OPEN	CONFIGURATION X.X DRAWINGS
TCS to C4I Systems (See ORD & C4I IPT Plans)	VAR	IDD	VARIOUS	TCS - C4I SYSTEM IDD
TCS Power Distribution and Control Assembly to Primary Power	PWR	ICD	CFG DWG	CONFIGURATION X.X DRAWINGS

AIR VEHICLE STANDARD INTERFACE (AVSI)



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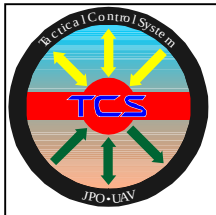


ARCHITECTURE

ARCHITECTURE REQUIREMENTS

- OPEN SYSTEM ARCHITECTURE
- JTA COMPLIANT
- DII COE COMPLIANT
- OPEN SOFTWARE ARCHITECTURE
- TAFIM COMPATIBLE
- GCCS COMPATIBLE

SYSTEM ARCHITECTURE RQMTS

- Architecture Requirements:
  - The TCS will be in an open architecture and be capable of being hosted on computers that are typically supported by the using Service [ORD003].
  - The software developed will be Defense Information Infrastructure/Common Operating Environment (DII-COE) compliant[ORD004]
  - The initial core of software will be generically written to provide Level Five interaction for both TUAV and MAE UAVs and establish the architecture for future tactical UAVs[ORD013]
  - Provide an open software architecture that can support future tactical UAVs (threshold) [ORD017].
  - Have software based on the Defense Information Infrastructure/Common Operating Environment per Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD(C3I)) Joint Technical Architecture (JTA) (threshold) [ORD018].
  - The TCS shall comply with the ASD(C3I) JTA [ORD106]. This includes, but is not limited to, the language, the computer, database, architecture and interoperability (threshold).
  - The TCS shall be capable of entering DII-COE compliant (C4I) systems, to include GCCS, that comply with the Technical Architecture Framework for Information Management and the Joint Technical Architecture [ORD110].
  - The standards developed for compliance with Common Imagery Ground/Surface Station (CIGSS), United States Imagery Standards (USIS), and GCCS (threshold) [ORD055].

OTHER FACTORS

- No Air Vehicle Changes
- No Up/Dn Link Changes
- Real-Time Air Vehicle Control Rqmts
  - These Factors Lead to Definition of:
    - Air Vehicle Datalink Control Module
    - Air Vehicle Standard Interface
- Real-Time Control Required by Some Subsystems and Interfaces
- Operator Workstation must be Service Standard (TAC / CHS)
  - These Factors Lead to Partitioning the System Into Real and Non-Real Time Computing Environments

ARCHITECTURES DEFINED

- **Army Science Board (ASB) Study, Summer 1994; C4I Service Chiefs Warrior Focused definitions, Jan 1996**
  - **The ASB and C4I Service Chiefs Warrior Focused Definitions Define Three Architectures as follows:**
    - *Technical Architecture* is the "building code" upon which systems are based
    - *Operational Architecture* is "missions, functions, tasks, information requirements, and business rules"
    - *System Architecture* is "a physical implementation of the OA, the layout and relationship of computers and communications"

TECHNICAL ARCHITECTURE (TA)

- **TA is a set of "Building Codes"**
  - **JTA, ARITA, DII/COE, CIGSS, etc.**
- **In the absence of a common enforced TA,**
  - **systems have been developed with their own sometimes unique and frequently closed infrastructures**
  - **interoperability has been problematic with continued reliance on "black box" solutions**
- **By itself it (TA) builds nothing**
- **Used in conjunction with other Architectures - the Operational and System Architectures - the adoption and enforcement of TA fosters interoperability between systems**

TCS TECHNICAL ARCHITECTURE DRIVERS

TCS Program Drivers

DoD Drivers

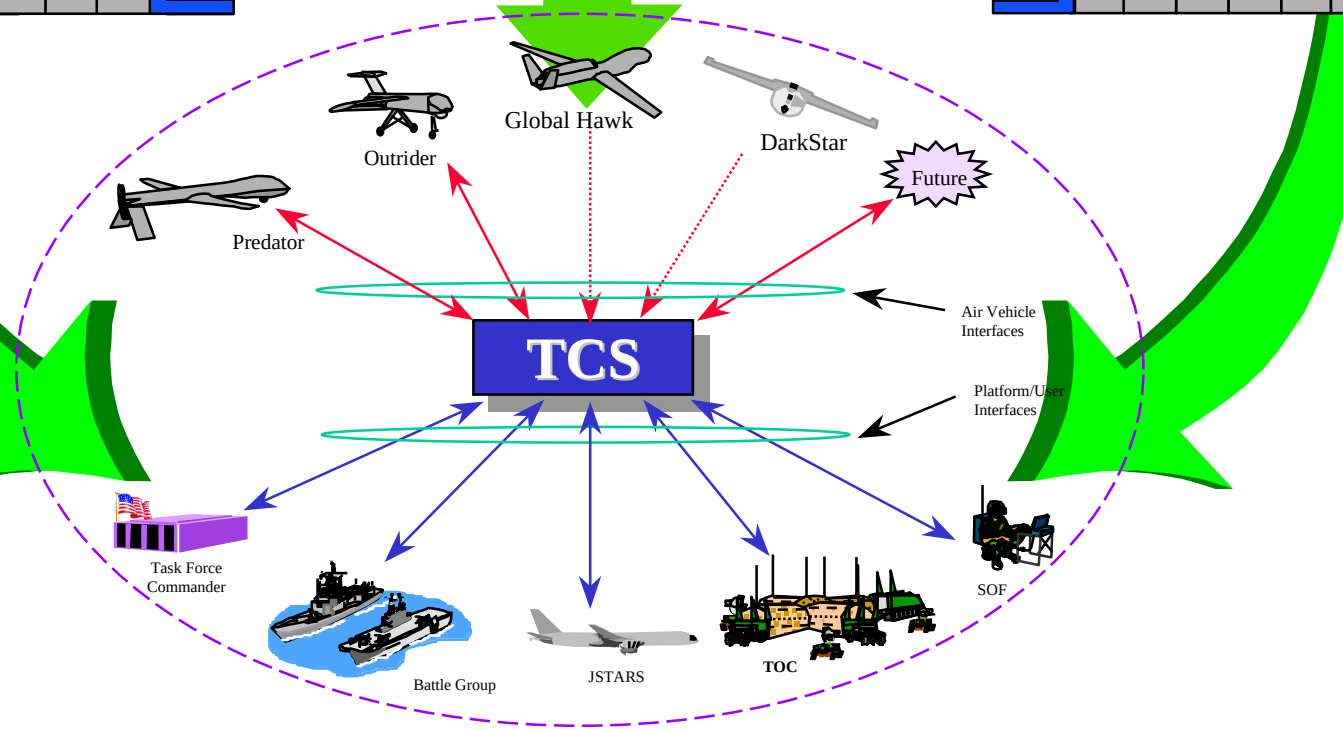
JTA
ARITA
DII COE
CIGSS
NTTF
USMTF
HCI
GOTS
Common Training

TCS Program Drivers

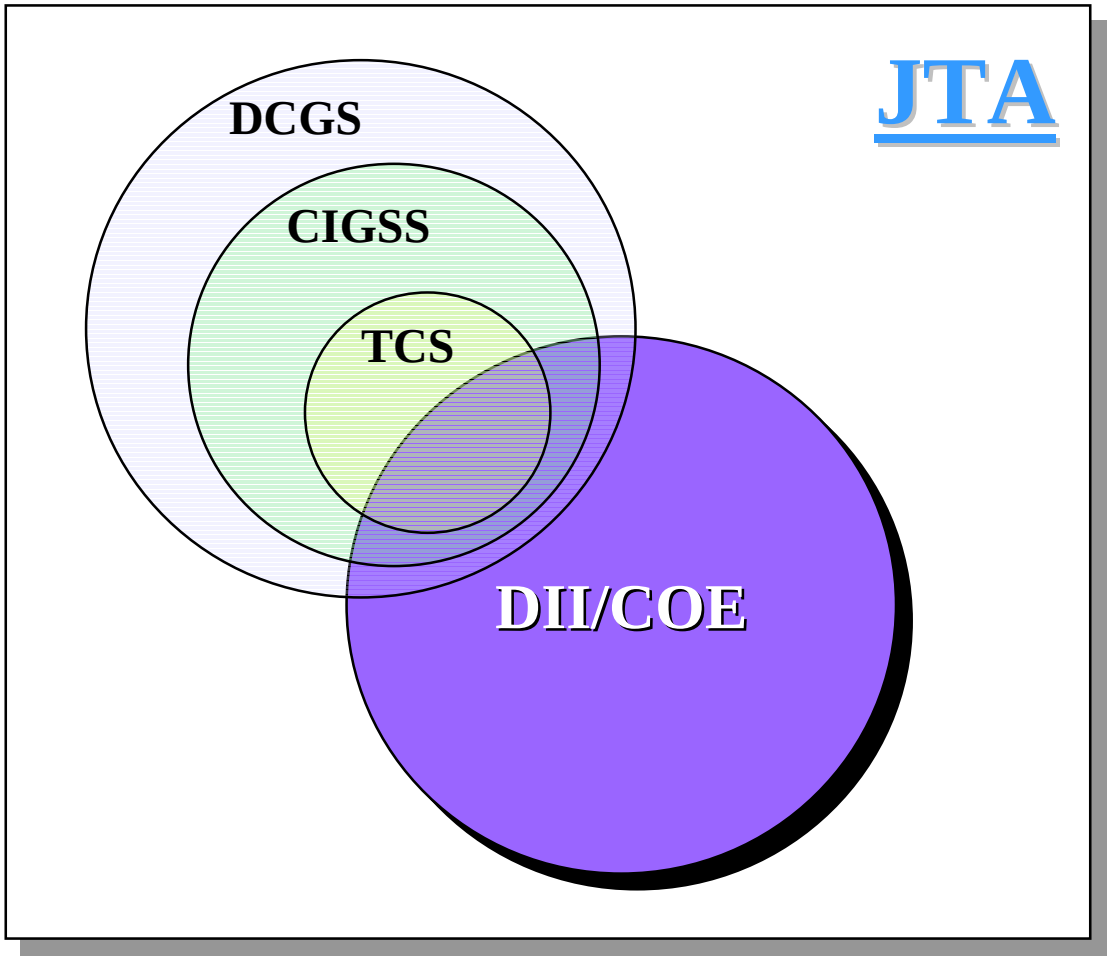
Joint Service
Scaleable Functions
Extensible
Common HCI
Open Arch.
Computing Platform Independence
Multiple AVs
Multiple Pylds
Export/Dissem .Info
I/F w/Existing C4I Systems

Industry Drivers

POSIX
MOTIF
X-Windows
COTS
Client/Server
Open Arch.
Platform Independence



TCS TECHNICAL ARCHITECTURE



TCS Implements All Applicable Architecture Requirements and Will Be DII/COE Compliant

TCS COMPLIANCE BASED ARCHITECTURE

JOINT TECHNICAL ARCHITECTURE (JTA)

MANDATED STANDARDS AND SOURCES
- Information Processing Mandated Standards
- Information Transfer Mandated Standards
- Information Modeling and Information Mandated Standards
- Human-Computer Interfaces Mandated Standards
- Information Systems Security Mandated Standards

DOCUMENT SOURCES
- Commercial Documents
- Government Documents

COMMON IMAGERY GROUND/SURFACE SYSTEM (CIGSS)

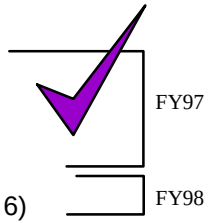
3. ARCHITECTURAL FEATURES
- 3.1 USIS Architectural Elements
- 3.2 Collection Element
- 3.3 Processing Element
- 3.4 Dissemination Elements
- 3.5 Archive Elements
- 3.6 Management Element
- 3.7 Site Infrastructure Elements
- 3.8 Digital Exploitation Element

4. IMPLEMENTATION CONSIDERATIONS
- 4.1 Software Development
- 4.2 NITFS Certification

4.3 Security Isolation

DEFENSE INFORMATION INFRASTRUCTURE / COMMON OPERATING ENVIRONMENT (DII/COE)

Appendix B: Compliance Checklists
- B-1. Standards Compliance (Level 1)
- B-2. Network Compliance (Level 2)
- B-3. Workstation Compliance (Level 3)
- B-4. Bootstrap Compliance (Level 4)
- B-5. Minimal DII Compliance (Level 5)
- B-6. Intermediate DII Compliance (Level 6)
- B-7. Interoperable Compliance (Level 7)
- B-8. Full DII Compliance (Level 8)



TCS is a <u>Compliance</u> based Architecture and will meet the requirements of CIGSS, and JTA where appropriate in view of the mission and will be implemented using the DII COE